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ABSTRACT

This publication is a collaborative effort between the science and education sections of UNESCO and particularly between UNESCO Regional Office for Science and Technology for Africa (Nairobi) and the UNESCO Regional Office for Education in Africa (Dakar). Articles in this issue focus on Africa: (1) The Belgrade Charter - A Guide to Environmental Education in Africa; (2) Environmental Education in Africa; (3) Eco-Education; (4) The Science Education Programme for Africa (SEPA) Supports Environmental Education in Africa; and (5) Towards an Association of Faculties of Science of the Universities in Africa. (RH)

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"SPECIAL ISSUE" Environmental Education

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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SCIENCE AND TECHNOLOGY EDUCATION NEWSLETTER

A Supplement to the Bulletin of the Regional Office of Science and Technology for

No. 7
September 1976

S P E C I A L I S S U E

ENVIRONMENTAL EDUCATION

SCIENCE AND TECHNOLOGY EDUCATION NEWSLETTER

No. 7 SEPTEMBER 1976

TABLE OF CONTENTS

Page

- Editorial:
  The Belgrade Charter - A Guide to Environmental Education in Africa 1

- Environmental Education in Africa 4

- Eco-Education 8

- The Science Education Programme for Africa (SEPA) Supports Environmental Education in Africa 12

- Towards an Association of Faculties of Science of the Universities in Africa 15

- NOTICE BOARD (at end of this issue) contains information about training courses, conferences, books and documents of interest to science educators in Africa.

SCIENCE AND TECHNOLOGY EDUCATION NEWSLETTER

SCOPE AND PURPOSE

The Science and Technology Education Newsletter provides a forum for the exchange of views, ideas and information among those working in science and technology education, at all levels, in Africa. It also carries news and information drawn from the wider world community when these relate to Africa. Readers are invited to submit material for the Editor's consideration. It should be noted that material bearing a writer's name is his responsibility and not that of the Editor for UNESCO.

The newsletter is a collaborative effort between the science and education sectors of UNESCO and particularly between UNESCO Regional Office for Science and Technology for Africa (Nairobi) and the UNESCO Regional Office for Education in Africa (Dakar).

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DAKAR, Senegal.

E D I T O R I A L

THE BELGRADE CHARTER
A GUIDE TO ENVIRONMENTAL EDUCATION IN AFRICA

Between 11 and 16 September, 1976, UNESCO convenes the African Regional Seminar on Environmental Education in Brazzaville, People's Republic of Congo, bringing its support of environmental education to Africa. Participants of this seminar will give attention to the following:

- considering the specific regional problems concerning African environment and environmental education;
- enquiring into causes of these regional problems to seek out solutions and develop strategies for applying them;
- discussing ways to promote sub-regional co-operation along socio-linguistic line enabling common programmes to be designed in African languages;
- exploring the part played by environmental education in African national economic and social development.

The Seminar will also give attention to a review and evaluation of the Belgrade Workshop recommendations in order to facilitate their implementation in the Africa region under African conditions and with African resources. For, this Brazzaville Seminar is a follow-up to the International Workshop on Environmental Education which was jointly convened by UNESCO and UNEP in Belgrade, Yugoslavia, in October 1975. That workshop adopted a statement of goals, objectives and guiding principles called the Belgrade Charter on Environmental Education. It sets forth clear and meaningful guidelines to the efforts by educators to promote environmental education in all regions of the world. An excerpt from that charter appears below:

The goal of environmental education:

To develop a world population that is aware of, and

concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solutions to current problems, and the prevention of new ones.

The objectives of environmental education:

Awareness: to help individual and social groups acquire an awareness of and sensitivity to the total environment and its problems.

Knowledge: to help individual and social groups acquire understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

Attitude: to help individuals and social groups acquire social values, strong feelings of concern for participating in its protection and improvement.

Skills: to help individuals and social groups acquire the skills for solving environmental problems.

Evaluation ability: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic and educational factors.

Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.

The principal audience of environmental education:

The general public. Within this global frame, the major categories are:
The formal education sector: including pre-school, primary, secondary and higher education students as well as teachers and environmental professionals in training and retraining; The non-formal education sector: including youth and adults, individually or collectively, from all segments of the population, such as the family, workers, managers and decision-makers, in environmental as well as non-environmental fields.

The guiding principles of environmental education:

Environmental education should: (a) consider the environment in its totality - natural and man-made, ecological, political,

(Contd. page 16)

ENVIRONMENTAL EDUCATION IN AFRICA

A convergence of trends and issues

A need to improve the quality of education is felt widely throughout Africa. The expansion in school enrolment which followed the Addis-Ababa conference of 1961 brought in its wake a number of difficulties. For one, the growth in numbers revealed deficiencies and inadequacies in the education systems of most African countries. This was hardly surprising since these education systems as they existed before independence had been oriented towards the welfare of a small elite and not necessarily towards the goal of national development. In any case, they were little adapted to play the role called for in the new context of national independence.

Improving quality in education begins with internal changes to classroom situations and teaching rendering the learning process more effective and reducing wastage that occurs through repetitions and losses. There are also some changes to be made external to the classroom. For example, it is intolerable that an education system should function well but turn out, year after year, scores of individuals who find themselves in utter conflict with their rural environment or qualified only for a narrow spectrum of competences not urgently required by the national economy. The education system must be adapted to the part it should play in developing the community and the national society in which it is embedded.

African countries must draw up aims for their educational systems that will fit the political, economic, social and cultural aims of their national policies. Such integrated national development is to be preferred to intensive personal development benefiting only a few individuals. In establishing democracies, education is seen as a powerful factor and efforts are being made to define a suitable profile: "a man who will be deeply rooted in the cultural traditions of Africa and in the African environment, aware of his political and civic responsibilities, of his duties to his family, and prepared to play a useful role as a producer and as a citizen in the economic and soical development

of the community".[1]

But African problems cannot be isolated from international ones. From elsewhere in the world come trends and issues which affect the present conjucture in Africa. Concern for the environment for instance was born of a crisis in the industrialized world, a sense of impending doom brought about by the prospect of unchecked industrial pollution coupled with demographic exponential increase. In 1962 Rachel Carson's book "The Silent Spring" sounded the alarm. The problem was brought to the international conscience in 1972 at the United Nations Conference on the Human Environment in Stockholm. The concern for a generalized environmental education was clearly expressed through recommendation 96, calling for the establishment of "an international programme in environmental education.

UNESCO then surveyed needs and priorities in environmental education world-wide and evolved two distinct educational programmes: one on human populations and the other on the environment. According to guidelines produced by the Belgrade workshop (October 1975) on environmental education (see preceding editorial), the environment must be considered in its entirety - natural and man-made, ecological, political, economic, technological, social, legislative, cultural and aesthetic. It cannot be treated as a subject in the same sense as, for example, mathematics, biology or language. Environmental education is interdisciplinary in nature and must adopt a problem-solving approach taking into account personal and social values, local constraints, and making use of available technology and financial resources.

UNESCO considers environmental education a call for relevance and not a programme of abstract and purely academic knowledge unrelated to the environment. The environment is not to be equated merely to the biological or ecological surroundings of rural areas or the predominantly industrial ambient of urban areas but also to the social, economic, political and cultural matrix in which man's life is embedded.

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1 Conference of Ministers of Education of African Member States, Draft Final Report, Lagos, February 1976.

Regional Programmes for Africa

UNESCO is sponsoring three main regional programmes in environmental education of benefit to Africa:

1) A Regional seminar taking place in Brazzaville from 11 to 16 September 1976 will discuss regional issues and formulate recommendations. About 20 experts in education (planners and teachers) from 15 different countries in Africa will be attending the meeting.

2) To back up immediate action in the region a number of innovative pilot projects will be selected for support. These projects should concern three important areas: environmental education for youth and adults in both formal and non-formal education settings, training of teachers and leaders in environmental education and the development of services, publications and materials in environmental education.

3) To provide the means for an effective exchange of ideas, information and experience, UNESCO is planning to establish an international network of communication in collaboration with the UNEP International Referral System. An important link in the system is given by the quarterly newsletter "Connect", the first issue of which appeared in January this year. (see preceding issue of this Newsletter, page 16).

Reports from the Regional Seminar in Brazzaville should interest educators in all countries of Africa. Copies of these and more specific details about follow-up activities should be requested by writing to UNESCO Regional Office for Education in Africa, B.P. 3311, Dakar, SENEGAL.

Educators who would like to request UNESCO support for innovative pilot projects of the kind referred to in (2) above, should provide information on all essential aspects of their proposed activity. This means giving adequate answers to such questions:

(1) What do you want to achieve?
(2) How do you propose to achieve it?
(3) How will you know whether or not you have achieved it?
(4) Who will help you achieve it?
(5) How much financial support are you requesting and for what purposes?

To assist in preparing a proposal, UNESCO makes available a flexible model which expands on these basic questions.*

Every proposal received under the UNESCO-UNEP programme will be reviewed by the environmental education staff of UNESCO and by UNEP. Due to the time required for review and perhaps for correspondence with the institution or individual submitting a proposal, several months may be expected to elapse before a final decision can be made.

F.P. NALLETAMBY
UNESCO Regional Office
for Education,
DAKAR, Senegal.

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* Proposals may be submitted at any time. However, it is recommended that proposals be submitted as soon as possible. A copy of the model proposal is available by writing to:

Environmental Education Section
Unesco
7, Place de Fontenoy
75700 - PARIS
France

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ECO-EDUCATION

THE INTERACTION OF SCIENCE, TECHNOLOGY AND EDUCATION FOR ENVIRONMENTAL QUALITY CONTROL

> Thus, we coin the term "eco-education" to create a concept which includes relations between ecological science and education. Eco-education aims to make people aware of and to develop the values, attitudes, knowledge and skills relevant for understanding trends of development in the total ecological and socio-cultural context.

We attribute the problems of the environment and of natural resources within it, in any country, to a variety of causes, including: natural disaster, the physical, biological and social effects of modern science and technology, the consequences of traditional science and indigenous technology, human abuse, and neglect of environmental quality control. In industrialized countries, these arise largely through modern advances in science and technology resulting in such environmental hazards as pollution (air, water, noise, radiation) and undesirable social effects. In less-industrialized Africa, sensitivity to these problems is less, although the indications are that preventive measures must be taken against future developments of this kind. For now, our environmental degradation, which is sufficiently significant to warrant anxiety and alarm, arises from natural disasters such as drought, floods, landslides, etc., or from poor sanitation, ineffective waste disposal systems, communicable diseases etc., bush-fires and other man-initiated mis-adventures that cause a lot of suffering, destruction, resource depletion and unnecessary environmental poverty.

Clearly, we have an eco-crisis - a world of rising population and dwindling resources. This underscores the importance of the inter-relation between man and his environment and the need for study of the inter-relationships between living organisms and their environment (ecology). The heightened sensitivity of many peoples to the concept

of environmental quality explains the rise of ecology as an important branch of science. Relevant to everyday life, it deals with ecosystems-relationships, interactions and inter-dependence between living organisms and their surroundings.

But because the most critical environmental problems do not correspond nicely to the areas of differentiation and specialization developed as advanced knowledge and skills in natural science, engineering and social science disciplines, we find it more appropriate to attack these problems from an interdisciplinary perspective.

Science, Technology and Education in Development

In the development process education seeks the optimal use of science and technology as agents of economic growth and social development. Science provides a pool of basic knowledge and understanding on which technology depends. It (science) has the special task of making technology (defined as the technique of "human mastery of the forces of nature and the practical application of natural laws through the use of scientific methods") empirically useful, i.e. undertaking necessary adaptations to special situations and needs. For this to happen, research into social and natural processes is indispensable and this can lead to the discovery of educationally significant factors in the environment.

Education includes the total process of adapting to the social environment, both in and out of school as well as before and after school. It seeks to waken people's self-awareness, self-reliance and self-esteem, and hence the capacity to improve their conditions of living by their own efforts. Education is thus a fundamental condition for economic progress, a necessity of the functioning of socio-economic systems.

Quality of Life and environment quality control

The quantitative and qualitative components of the Quality of Life concept convey intricate relationships between basic human needs and the human aspirations of persons to reach their full development. In all types of societies, affluent and poor, ancient and modern, large and small, human beings need to seek new life styles which do not

depend upon the kind of economic growth involving the exhaustion of the earth's resources, destruction of the land, the sea and the air, styles which avoid large dehumanizing machine-like bureaucratic and industrial structures which fragment communites and alienate human beings from themselves and from each other.

The social effects of science and technology present impediments to the better Quality of Life envisaged. Technology itself - a systematic, rationalized managerial manipulation of people and things - seems to lead in-exorably to dehumanization. The profound impact that technology has on any traditional culture could result in many important values being inevitably lost; others may survive only in a degraded form. What we must do, however, is to exploit technology's capacity to enhance the quality of life through adapting technological processes to suit the values of individual cultures.

Paradoxically, even the planned and structured society can be an impediment. While it served the common good through the acquisitiveness of centres of economic and technological power, it can at the same time impose unsuitable solutions, especially when it becomes bureaucratic and loses touch with the human realities of the populace it is meant to serve. Such a conflict of competing values can only be resolved by each society having due regard for its own history and its political and cultural traditions.

Finally, more ultimate and intractable obstacles to a better quality of life lie in human nature itself. No system is proof against the corruptions of the people in it but at the same time all human beings have within them possibilities for moral growth, and this is one of the exciting challenges to which education must address itself.

Environmental education for quality control and a better quality of life

The 1972 UN Conference on the Human Environment was told that "In every area of environmental concern there are very few professionals with the training and experience needed to understand and manage multi-disciplinary relationships, particularly those involving the common ground shared by scientists, technologists and educators on the one hand, and the political decision-makers on the other."

That Conference established the United Nations Environment Programme (UNEP) and charged it with "stimulating, initiating and coordinating environmental activities among nations and within the UN system." UNEP in turn then moved to set in motion a massive educational programme for informing people about problems of the environment and motivating them to seek solutions. UNEP's view is that programmes for technical quality control of the environment will succeed only if people are educated to be aware of, and concerned about, the environment and its associated problems, and if they have the knowledge, skills, attitudes, motivation and commitment to work individually and collectively toward solutions to problems.

UNEP wants Environmental Education that can cause interaction of science, technology and education in behalf of environmental quality control and a better quality of life. Education acquires an environmental dimension when people are aware of the environment, are informed about the physical and biological laws which govern its behaviour, and are motivated to solve environmental problems. To develop this kind of education there is a need for strategies, aims and curriculum content. The connections between natural science and the main aims of general education must be strengthened. In teaching this form of education, the dynamic, creative and expressive qualities must be balanced against the more systematic educational-technological approaches. Environmental education stresses the human, cultural and social implications of scientific knowledge, and in this way helps people to play their part in environmental quality control and at the same time to guarantee themselves a better quality of life.

V.O. Ibikunle Johnson
Senior Research Fellow,
Institute of Education,
University of Sierra Leone.

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THE SCIENCE EDUCATION PROGRAMME FOR AFRICA (SEPA) SUPPORTS ENVIRONMENTAL EDUCATION IN AFRICA

NEW SEPA OFFICERS

The SEPA Secretariat in Accra, Ghana, has a new Executive Secretary, Mr. Edmund T. Cole, former Chief Education Officer, Ministry of Education, Social Welfare and Rural Development, Sierra Leone. There is also a new position of a Programme Director which is filled by Dr. Hubert Dyasi, the former Executive Secretary of SEPA. The new Chairman of SEPA is a former Executive Committee Member, Mr. Y.Y. Okot, the Chief Inspector of Schools, Ministry of Education, Uganda.

Representatives of the fourteen participating states met in Nairobi during 18 - 23rd August 1976 for the 5th Biennial Assembly of the Representative Council of the Science Education Programme for Africa (SEPA). The Representatives consisted of Ministry of Education officials involved in policy-making, scientists from universities, and science educators from institutes of education. Observers also attended from the British Council, U.S.A.I.D., Education Development Center (EDC), U.S.A. and UNESCO. The African states attending were The Gambia, Ghana, Kenya, Liberia, Nigeria, Sierra Leone, Uganda, Swaziland.

The main emphasis of this meeting was to appraise past programmes and projects, and to consolidate SEPA's efforts into a unified science education, and at the same time to seek new directions ahead to increase the contribution of Member States towards operating the Secretariat, making it completely supported by African Member Sates.

The Council affirmed the urgent need to make SEPA activities increasingly more relevant to the needs and aspirations of African people through introducing scientific methods into everyday activities involved in farming, sanitation and health, and the conservation of natural resources. It voted to continue the following on-going programmes:

(a) Science Education Training Course
(b) Teacher Training Materials Development
(c) Environmental Science Education
(d) Education Evaluation
(e) Concept formation in the learning of Science and Mathematics by African children.

With regard to (c) above, emphasis was placed on a new non-formal (out-of-school) environmental science education programme for children in the rural areas. This attempts to take care of the large number of young people who either have no opportunity of attending school, or have dropped out before completing the formal system of education. Items 1, 4, and 8 of the list of documents that follows should be of particular interest to educators in Africa who seek assistance in mounting programmes in environmental education.

BIBLIOGRAPHY OF SELECTED SEPA MATERIALS

1. Our Environment: A Science Handbook for Teacher Training Colleges. Report of Workshops for Science Lecturers at Teachers Training Colleges 1972/73. 293 pp. SCDC, Njala University College and SEPA Secretariat, Accra.

2. Ohuche, R.O. SEPA Science and Learning Theory. Science Teacher Education Monograph No. 1. 25 pp. 1974 SEPA Secretariat, Accra.

3. Dyasi, H.M. & Cole, N.H.A. The Role of the Science Education Programme for Africa in the Learning of Integrated Science in Africa. Educational Development International 1, 131-135, 1973.

4. Environmental Science Education for Pre-Service Primary Teacher Education - Report on SEPA/UNEP/UNESCO Workshop, Nairobi, Kenya 1974. SEPA Secretariat, Accra, 66 pp.

5. International Centre for Educational Evaluation - Information Brochure for Training Course for Evaluators, 1976-77. Institute of Education, University of Ibadan and SEPA Secretariat, Accra.

6. Handbook for Teachers. Teacher Training Materials Development Programme. 341 pp. 1974 SEPA Secretariat, Accra.

7. Report to UNESCO on Meeting of Standing Committee on Learning of Science and Mathematics Concepts by Children in Africa, at Mombasa, Kenya. 48 pp. Jan. 1975 ... SEPA Secretariat, Accra.

8. Dyasi, H.M. Environmental Science Education for Out-of-School Children in Selected Rural Communities in Africa: A Shift In Perspective in a Strategy for Change. 23 pp. (Draft), 1975. SEPA Secretariat, Accra.

9. Agbenyega, C.O. Training Science Educators for Africa: Evaluation Report of Science Educators Resident Training Course, Njala University College, University of Sierra Leone, 1975. SEPA Secretariat, Accra. 57 pp.

10. L'Enseignement Scientifique de l'Environment dans les Ecoles Primaires: Rapport du Seminaire de Brazzaville, May 1975. PESA/UNEP/UNESCO. 129 pp. SEPA Secretariat, Accra.

11. Source book for Teachers. Teacher Training Materials Development Programme. 500 pp. (in press 1976) SEPA Secretariat, Accra.

Science Education Programme
for Africa (SEPA)
P.O. Box 9169, Airport,
ACCRA, Ghana.

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TOWARDS AN ASSOCIATION OF FACULTIES OF SCIENCE OF THE UNIVERSITIES IN AFRICA

Readers of this Newsletter are aware that the UNESCO Seminar on the Improvement of University Science Education (August 1975, Nairobi) (see Newsletter No.5 October 1975 and No. 6 February 1976) gave rise to continuing efforts to form an association of the faculties of science in Africa. A committee under the chairmanship of Prof. Douglas Odhiambo, Deputy Vice-Chancellor, University of Nairobi, has been providing direction to these efforts. They met recently from 22 to 24th April 1976 at the Faculty of Science, University of Yaounde, (Cameroun) to draft a constitution for an association of faculties of science that, hopefully, could be adopted at a full gathering of representatives of faculties of science envisaged for Spring, 1977. By way of preparation for that forthcoming full meeting, or "Constitutive Assembly", the Committee gave thought to the ideas and topics which could form the agenda of that meeting. Retaining the title proposed by the Nairobi Seminar: "Effective Science Teaching in African Universities", the Committee made this a principal theme to be discussed in plenary sessions under two subsidiary topics:

(a) "The Efficiency of Science Education in Africa"

(b) "The African Attitude towards Scientific Training"

Under the first topic, the meeting would examine the present educational methods and the views of conservative educationalists and public authorities against the background of constantly changing educational techniques, media and science education materials. Under the second topic the meeting would consider the general attitude towards scientific training and would study the results of questionnaires sent to different African universities.

Through a secretariat set up at University of Yaounde, the Organizing Committee will now canvas the 53 existing members of the AAU and other concerned organizations to obtain their views on the draft constitution.

The Committee anticipates that 180 scientists from African universities will take part in the Constitutive Assembly with at least three specialists (mathematics, physics or chemistry and biology) coming from each science faculty.

The Committee will soon circulate the minutes of their Yaounde meeting amongst faculties of science in Africa. Professor M. Bopelet (University of Yaounde) and Professor K. Kekeh (University of Benin) are making the

detailed preparation for the Constitutive Assembly in 1977. The Association of African Universities is cooperating fully in this effort.

D. ODHIAMBO
Deputy Vice-Chancellor, University of Nairobi
Chairman, Organizing Committee.

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In parallel to the efforts of this Committee, UNESCO Regional [illegible] for Science and Technology in Africa has been pursuing follow-up to the Nairobi Seminar on University Science Education along two principal lines: First, we have used the pages of this Newsletter to stimulate interest among science faculties in Africa in new methods and techniques of instruction (see especially pages 3 to 6 of the preceding issue of this Newsletter, No. 6, February 1976).
Second, we have written recently to the participants of the Seminar asking them to write us about their own follow-up efforts.

Responses to our offer of documents on Keller Plan and other instructional innovations have overwhelmed us - and although our supply of those documents is exhausted, we shall try to obtain more if others, who have not yet done so, write in asking for the materials. A few replies to our recent letter to participants have also been received. Below are excerpts from several of these:

> You may be interested to know that we have succeeded here in working out a new structure for the education students, and particularly the science students, to be implemented in October this year. We have for some time felt the need for innovation, effective assessment and greater subject content in our present syllabuses. The new structure is intended to lay more emphasis on these areas. What wasdiscussed at the Nairobi Seminar was relevant to our own problems here and what I personally learned there was of great value in as much as it enabled me to tackle our curriculum development programmes.
>
> Dr. B.B. Chimpamba
> University of Malawi
> Zomba, Malawi.

> The final report on the Nairobi Seminar was made available to all interested staff from the Dean's office. The report did cause some interest in the Ministry of Education in Lusaka, who were keen to know what remedial measures should be taken to improve motivation and background knowledge of science in schools. I am hoping that my successor will act in an approriate manner to give the necessary guidance and assistance.
>
> Prof. M.S. TAMBIAH
> University of Zambia

EDITORIAL: The Belgrade Charter (Contd. from page 2)

economic, technological, social, legislative, cultural and aesthetic; (b) be a continous lifelong process, both in-school and out-of-school; (c) be interdisciplinary in its approach; (d) emphasize active participation in preventing and solving environmental problems; (e) examine major environmental issues from a world point of view, while paying due regard to regional differences; (f) focus on current and future environmental situations; (g) examine all development and growth from an environmental perspective; (h) promote the value and necessity of local, national and international co-operation in the solution of environmental problems.

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RESOURCES FOR SCIENCE EDUCATION IN AFRICA.

(1) POST-GRADUATE COURSES OPEN TO SCIENTISTS IN AFRICA

- International Seminar in Physics and Chemistry
  (for research training in Swedish laboratories)
  September 1977 to July 1978
  Apply before 1 March 1977 to Swedish Diplomatic mission in your country.
- Post-Graduate Training Course on Limnology
  (the ecology of inland waters), Vienna, Austria
  February to October, 1977
  Apply before 31 October 1976 to Austrian Diplomatic mission in your country.
- International Post-Graduate University Course in Petroleum Refining and Petrochemical Industry
  December 1976 to October 1977, Romania
  Apply before 1 October 1976 to:

  Rectorat
  Institutul de Petrol si Gaze
  Bulevardul Bucuresti Nn. 1
  PLOIESTI, ROMANIA

(2) SERVICES AVAILABLE TO SCIENCE EDUCATORS AND THEIR INSTITUTIONS:

- International Educational Reporting Service (IERS)
  - Innovation (A bi-monthly newsletter about the IERS - constituent centres, documents, studies),
  - Awareness list (A bi-monthly bibliography of recent documents on educational innovations, particularly in the Third World. Printed from a computer master, it is intended for educational documentation and research centres)
  - Question and Answer Service (in experimental phase at present)

  Address:

  IERS
  International Bureau of Education (UNESCO)
  Palais Wilson
  1211 Geneva 14
  Switzerland

(3) PUBLICATIONS OF INTEREST TO SCIENCE EDUCATORS IN AFRICA

- UNESCO, International Association of Hydrological Sciences, Mathematical Models in Hydrology 3 volumes. (Proceedings of the Warsaw Symposium, July 1971).

These volumes contain the symposium papers and discussions. Volume 1 deals with Structural analysis of hydrological sequences, statistical techniques and multi-dimensional stochastic processes in hydrology; and stochastic analysis of water storage problems. Volume 2 deals with the fitting of conceptional catchment models; distributed parameter catchment models, hydrodynamic models of river systems, lakes and estuaries; functions and constraints of water resources systems and their optimal operation and planning of systems for regional development in water resources.

Since UNESCO sees mathematical modelling in hydrology as one of the major tools for advancing the science of hydrology, it hopes wide use will be made of these published proceedings which, owing to their variety and high quality, ensure their wide applicability.

- The Present Status and Future Prospects of Solar Energy Utilization in Africa, prepared by W. Palz for UNESCO (Paris, 1 February 1976)

A report based on information gained by the author as a participant in the UNDP (May 1975) mission to Sahel countries in Africa. Features brief descriptions of on-going work in institutions in Africa.

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Science educators in Africa who are acquainted with the STEP (Science Teachers Education Project) in the U.K. may be pleased to learn that the Australiam counterpart of this, ASTEP, has published a booklet "A Project in Teacher Education" which contains the Australian adaptations and extensions of the STEP materials (47 units in Activities and Experiences). This valuable booklet is available to educators at a cost of US$8.00 and may be ordered from:

Mr. J. Northfield
General Editor, ASTEP
Faculty of Education
Monash University
Clayton, Victoria, 3168
AUSTRALIA.